

NOTES ON *TROCHONANINA* AND OTHER GENERA OF LAND MOLLUSCA, WITH REFERENCE TO THE GENERIC POSITION OF *MARTENSIA MOZAMBICENSIS* AND OTHER SPECIES.

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PLATE XIX.

THE following notes have been made after the examination of a species of land-shell collected by Dr. J. W. Gregory, when on his well-planned, well carried out, and most interesting journey in Eastern Africa, during 1893, accounts of which have been given in papers read before the Geological and Geographical Societies in 1894. I am indebted to Mr. Edgar Smith for the specimens I now describe.

MARTENSIA MOZAMBICENSIS, Pfr.

Helix Mozambicensis, Proc. Zool. Soc. 1855, p. 91, pl. xxxi, fig. 9.

Trochomorpha ——— Pfr, Vers., p. 132.

————— ——— Albers, Die Heliceen, 1860, p. 60.

Martensia ——— Semper, Moll. Philippinen, 1870, p. 42.

Trochonantina ——— V. Martens, Monatsb. Akad. Berlin, 1878, p. 289.

The shell is well known and fully described; I therefore only give its size, which is 10–13 mm. in diameter, but it varies much in height.

Animal.—From spirit specimen (Fig. 1). Length 11·5 mm. Black in colour throughout, perhaps a very dark grey in life. The pallial margin is wide; the principal linear markings on the side of the foot are regular, distant, and very conspicuous; the divisions along the pallial line are also very oblong. The mucous pore is a linear slit, not extending to the sole of the foot behind. It is overhung by a very long, pointed, horn-like protuberance, which is a continuation of the keeled foot; this even in the spirit specimen is very long and sharp-pointed, so that when fully extended in life it must present a most remarkable appearance (Fig. 1*a*). The mantle has no shell lobes; the left neck lappet is apparently separated from the right one, and is long and narrow in form, with an indication of a separate posterior lappet. The right neck-lobe was not well preserved in the two specimens I received, but there did not appear anything very different on that side from most other allied forms. The sole of the foot has a central area. The jaw is almost semicircular in outline, the cutting edge concave, with a strong and large central convex projection. The radula is broad—

30 : 12 : 1 : 12 : 30 about,
or 42 : 1 : 42

The centre tooth is elongate, with small cusps at the base on either side; the admedian teeth are broad, with the cusp only on the outer

basal side; the laterals are elongate, curved with a slight notch some way below the point (Fig. 1e).

Genital organs (Fig. 1b).—There is no amatorial organ corresponding to the dart sac. The male organ has a short, free flagellum near the junction of the *vas deferens*, and close to this the retractor muscle is given off; thence the sheath is tubular, widening out below considerably, the *vas deferens* being laid up against it for the whole distance, close to the base; this is suddenly thickened into a round white sac or diverticulum (the kale sac of Semper), the economy of which it is difficult to imagine; it thence continues as a thin cord to the ovotestes. The spermatheca is very long, wide, and ample at the posterior end. The albumen gland, and all above, had been lost in extracting the animal from the shell. Very interesting was it to find the spermatophore in the spermatheca (Fig. 1c). It consists of a very long, slender tube, given off from a knob-shaped sac. It is quite smooth on the sides throughout, the usual serrations or spines being absent. In the second specimen examined the male organ was the same as shown by Semper (Fig. 1d), with an accessory gland.

The very elongate, large size of the overhanging lobe above the mucous pore, quite tail-like in form, recalled at once Semper's genus *Macroceras*, from Cebu, Leyte, and Samar, of which he gives drawings both of the animal and of different parts: this work of Semper's is excellent, and invaluable for investigations of this kind. It is interesting to find an African species presenting a similar development of the foot, but still more so to find that here similitude ends. If we looked no further, the two species would be considered congeneric. The internal organs, however, are quite different, and the two forms are widely separated—*Macroceras* has a straight-edged jaw, with very peculiar, bluntly pointed, simple dentition; an amatorial organ is present, and there are besides other differences in the genital system.

I now proceed to notice the following genera, and some of the species included in them by different authors—

<i>Trochomorpha</i> , 1850	Albers.	Type not indicated.	
(Zonitidæ?) 1860	Do. 2nd Edit.	Type: <i>H. trochiformis</i> , Fér.	Tabiti.
<i>Discus</i> , 1850	Albers.	Type not indicated.	
1860	Do. 2nd Edit.	Type: <i>Metcalfei</i> , Pfr.	Borneo and Philippines.
<i>Vidua</i> , 1855	H. & A. Adams.	Types: <i>planorbis</i> , Less. <i>Metcalfei</i> , Pfr. <i>acutimargo</i> , Pfr. } All included in <i>Discus</i> .	New Guinea. Borneo. Negros, Phi- lippines.
<i>Nigritella</i> , 1860	Albers. 2nd Edit.	Type: <i>H. nigritella</i> , Pfr.	Marquesas, Society Is.
<i>Sivella</i> , 1863	W. T. Blanford.	Type: <i>H. castra</i> , Bens., Ann. & Mag. Nat. Hist.	E. India.
<i>Martensia</i> , 1870	Semper.	<i>H. Mozambicensis</i> , Pfr.	East Africa.
(Zonitidæ)			
<i>Trochonanina</i> , 1871	Mousson.	<i>H. Schmelztiana</i> , Mouss., Mal. Blatt., p. 138.	Upolo.
<i>Vitrinoconus</i> , 1873	Semper.	<i>H. eyathellus</i> , Pfr.	Luzon.
<i>Zangis</i> = 1878	V. Martens.	<i>H. radiolata</i> , V. Mts.	East Africa.
<i>Martensia</i> .			

The genus *Martensia* was described by Semper in his "Reisen im Archipel der Philippinen," 1870, p. 42; and *Helix Mozambicensis*, Pfr., was taken as the type, and its anatomy described and figured on plate iii, fig. 5*b*, and plate vi, fig. 15. Previously this species had been placed in *Trochonanina* by Mousson, Journ. de Conch., vol. xvii, 1869, p. 330. The type of this genus, however, is a shell from Upolu, for Mousson had before him, and was describing at the time, a new species, *T. Schmeltziana*, from that island. He separates the genus from *Trochomorpha*. The description is very short, and based on shell characters alone, particular stress being laid upon the sculpture of the upper surface as compared with the smooth and polished under side. This led him to say that it belonged to a numerous group, and he placed in it shells from such very distant and distinct regions as Borneo and Africa, *Helix Mozambicensis* being among one of the species included, the others being—

Helix conus, Phil., Java (imperforate).

— *rectangula*, Pfr., Marquesas (imperforate).

— *insculpta*, Pfr., Norfolk Island, placed in *Thalussia* by Nevill. Hand-list, p. 52.

— *argentea*, Reeve.

— *Calabarica*, Pfr., Old Calabar, Guinea, Proc. Zool. Soc. 1856, p. 327.

— *conicoides*, Met. } Borneo.

— *Labuanensis*, Pfr. }

— *lychnia*, Singapore, Bens.

I would suggest retaining in *Trochonanina* the Pacific Island shells, with *T. Schmeltziana* as the type, the animal of which yet requires examination; then we can better locate the remainder in other genera. When shell character alone is made the basis of classification, why a shell like *Helix conicoides*, so dissimilar, and with a solid columella, is linked with forms like *H. Mozambicensis*, it is difficult to understand.

Now with regard to *H. Mozambicensis*, in the Monats. der Konig. Preus. Acad. Wiss. Berlin, April 1878, Von Martens, when describing some East African shells, following Mousson, placed this species in *Trochonanina*, as well as the species *Helix pyramidea*, V. Mts. (from Ukamba), and *Helix Jenyusi*, Pfr. (Pangani); but for the species *H. radiolata* (Taita), he founded a new genus, *Zingis*, and figured the generative organs. These appear to me to be incomplete: had they been in a better state of preservation they would probably agree well with Semper's drawing of those of *H. Mozambicensis*. The description of the extremity of the foot, with the strikingly long overhanging lobe, is identical. I cannot believe that with so great a similarity in the shell and the animal, as well as the radula and jaw, there can be two distinct genera of the Zonitidae in this part of Africa, and I therefore consider *Zingis* to be a synonym of *Martensia*.

We have next to deal with *Helix conicoides* and *H. lychnia*. The first is a very distinct form, and I have been able to examine a spirit specimen, thanks to the labours of Mr. A. Everett, in Borneo, who

collected and sent home so much valuable material. An examination of the history of this species carries one into the genus *Trochomorpha*—Albers, 1850; type *trochiformis*, 1860, of Tahiti—which is a Pacific Island form; hence it is very doubtful if the many species placed in it from very far distant countries have any relationship to it. The best account of *Trochomorpha*, after that by Von Martens in Die Preuss. Exped. Ost-Asien, 1867, is the one by Stoliczka, in the Journ. Asiat. Soc. Bengal, 1873, p. 20. He describes *H. castra*, Benson, a shell with a wide Indian range, giving all the details of its anatomy, with those of another species, *H. timorensis*, collected at Penang.

Stoliczka alludes to the work of Von Martens, and the latter's division of this group into two sections—No. 1, the *Nigritella* of Albers, with its type *nigritella*, a Pacific Island shell (Marquesas); No. 2, the *Vidua* group, in which its author, Adams, placed *H. planorbis* and similar shells, like *H. castra*, etc., all widely and perspectivevely umbilicated, forming a very easily distinguishable group; while with them V. Martens associated another very different set, *H. conus*, *H. conicoides*, *H. lychnia*, etc. *H. ternatana*, Guillou (= *H. batchienensis*, Pfr.), he placed in *Nigritella*.

On referring to the description by Stoliczka of *H. castra*, Bens., it is seen that it can at once be separated from the discoid shells of the Andamans and Borneo. The generative organs (Fig. 5) are different, the very great length of the spermatheca being especially striking. The jaw (Fig. 5a) and radula (Fig. 5b) are also different, particularly the latter, as shown on pl. ii, fig. 9, Journ. Asiatic Soc. Bengal, 1873; the tricuspid and central bicuspid laterals being much more like Indian Helicoid forms. The construction of the shell also differs in the manner in which the last whorl grows upon the penultimate one near the suture. These differences are quite sufficient in my opinion to constitute a distinct subgenus, and I accept Mr. W. T. Blanford's genus *Sivella* for *H. castra* and its Penang ally, identified by Stoliczka as *H. timorensis*. Whether this shell from Penang is the same in its anatomy has yet to be proved.

Having examined the anatomy of *H. bicolor*, from Borneo, and *H. trilineata*, from Great Nicobar Island, described in detail further on, I find they are in all important respects alike. The radulae are distinguished by the simple straight-sided central tooth, followed by similar plain median teeth, the laterals being bicuspid. The jaw in *trilineata* has a central projection. The shells are widely umbilicated, discoid, and sharply keeled. There are slight differences in their male organs, but these are not important. Both species differ in their anatomy from *S. castra*, Bs., as described by Stoliczka, and I locate this latter species in the subgenus *Discus*, of Albers—type, *H. Metcalfei*, which is a good and distinct one. In the past year I find that Professor Wiegman, of Jena, has described the species *H. planorbis*, Lesson, from Sumatra, in a paper, "Beiträge zur Anatomie der Landschnecken des indischen Archipels," in Max Weber's zool. Ergebnisse einer Reise im Nderland. Ost-Asien, iii, 8 pls. This is an excellent and most welcome addition to our

knowledge of the Land Mollusca, and is well illustrated. The radula is similar to that of the species I am now describing; the jaw, however, has no central projection. He also describes *II. costulata*, Von Martens, which has a similar jaw, but differs in its radula, in which, though the centrals are still plain straight-sided teeth, the outermost laterals at the 20th and 21st tooth are curved and unilinear. He has placed them both in *Trochomorpha*. The formulæ for their radulæ are—

II. planorbis 39 : 10 : 1 : 10 : 39
49 : 1 : 49

II. costulata 38 : 10 : 1 : 10 : 38
48 : 1 : 48

Differences, similar to those noted above, separate these two species from *Sivella castra*, and they fall naturally into *Discus*.

1. *Discus trilineatus*.

Hab.—Great Nicobar (De Röepstorff).

Animal.—Has no overhanging lobe at the extremity of the foot: the slit of the mucous gland can not be discerned owing, possibly, to the contracted state of the spirit specimen, though the wide pallial fringe and the shape of the extremity of the foot point undoubtedly to its presence. The animal is black in colour, with a pale foot beneath, and above the pallial margin is finely papillate. The jaw has a central projection. The radula (Fig. 2*b*) has the teeth arranged + 9 : 11 : 1 : 11 : 9+? It was unfortunately imperfect on both the lateral sides, where the teeth are very small. The twenty-two centrals are plain straight-sided teeth, the centre tooth not so broad as those on either side; the laterals are curved, short, and evenly bicuspid.

The generative organs (Fig. 2).—The *vas deferens* joins the male organ below the retractor muscle attachment, and at its junction is closely coiled upon itself (Fig. 2*a*); this was seen in two specimens dissected. The spermatheca is only of moderate length, and thus these organs have a very distinct construction to that which Stoliczka describes in *Sivella castra*. The other parts of the generative organs do not call for any special mention.

2. *Discus bicolor*.—Borneo (A. Everett).

Animal.—Jaw not seen, probably like that of *D. trilineatus*. The central teeth of the radula are plain, straight-sided, as in *D. trilineatus*; the outermost are, moreover, short and evenly bicuspid, becoming very minute on the edge; the formula being—

30 : 2 : 10 : 1 : 10 : 2 : 30
or 42 : 1 : 42 :

The generative organs (Fig. 3) do not materially differ from those of the last described species; the muscular attachment is above that of the *vas deferens*; the spermatheca is rather short and elongately club-shaped.

Since writing the above, I have seen the Manual of Conchology,

structural and systematic, by G. W. Tryon, continued by H. A. Pilsbry, which is a welcome work and very thoroughly done. The genus *Trochomorpha* is treated of in Part 33; his divisions, I see, correspond on the whole with mine, particularly in the acknowledgment of Blanford's genus *Sivella*, on account of the long duct to the spermatheca, but he does not allude to the great difference in the radula also. But *Discus* has surely priority over *Vidua*.

3. *Helix* (?) *conicoides*, Metcalfe.

The animal in spirit is of a pale ochre colour, with a distinct mucous gland and a short overhanging lobe, unlike the small hidden slit of *Sivella castra*. The right dorsal lobe is small, the left is narrow and divided. The duct leading to the anal orifice is barred and spotted with black on a white ground, which in life shows strongly through the shell.

Odontophore (Fig. 4d).—The central tooth rises from a broad base; is simple, long, narrow, and pointed; no basal cusps. At the 13th tooth the bicuspid form commences, the outer cusp low down—this rises gradually; and the outermost teeth are evenly bicuspid.

$$55 : 3 : 10 : 1 : 10 : 3 : 55 \\ 68 : 1 : 68$$

Jaw semicircular, with a central projection (Fig. 4c).

Generative organs (Fig. 4).—The penis is large, muscular, with the *vas deferens* joining it at the posterior end, the retractor muscle being attached a short distance below it. There is no amatorial organ with *sagitta amatoria*. In three specimens I examined the spermatophore (Fig. 4b) was present; in one case (Fig. 4a) at its place of development near the junction of the *vas deferens*, in the other two it was found lower down, and close to the generative aperture (see Fig. 4). It is hard, pointed and solid, triangular in form in front, then coiled on itself, and terminating behind in a long cylindrical sac. In one crushed specimen there were four well-defined spines visible, but their correct position in the perfect animal could not be made out.

I think it is now shown that *Sivella* and *Discus* differ in a sufficient number of characters to be considered subgenerically distinct. This disposes of a number of species that have been put into *Trochomorpha*. The animals of a great many more wait for examination; some may not even belong to the Zonitidæ at all. Semper places *Trochomorpha* in the Helicidæ. There is a slight difficulty in determining which species is the type; *T. conus*, of Java, heads the list of sixteen species in the original description by Albers in 1850. He no doubt at that time considered them of equal value; the selection of a single type was not then considered of the importance it now is, and it was quite an accident which species headed the list; but in the second edition of Albers's work by Von Martens, the typical species of every genus is indicated, and in this case it is *T. trochiformis*, Fér., of Tahiti. I have not yet obtained any species from that part of the world. Semper gives a description and figures of the radula of *T. subtrochiformis*, which he places in *Vidua*: this, however, is not

